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RESEARCH ARTICLE

A review of *Apha floralis* species group (Lepidoptera: Eupterotidae)

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Abstract

5 species of the genus *Apha* Walker, 1855 are included here under the *floralis* group, three of which are described as new: *A. zephyrus* **sp. nov.** (type locality: China, Yunnan, Dianceng Shan, 2.200 m), *A. witti* **sp. nov.** (type locality: China, Sichuan, Qionglai Shan, 1.400 m) and *A. chloralis* **sp. nov.** (type locality: Vietnam, Cha Val, Nam Giang, Quang Nam, 546 m). Types of all species are illustrated, biology and morphology of preimaginal instars are discussed for *A. kantonensis* Mell, [1930] and *A. chloralis* **sp. nov.** A new synonymy for *Apha* Walker, 1855 and *Preptothauma* Draudt, 1931 (including a single mislabeled species *P. oxydiata* Draudt, 1931), **syn. nov.** is established.

Keywords

Lepidoptera, Eupterotidae, China, Vietnam, Apha floralis group, taxonomy, morphology, new species

Introduction

This article forms part of a planned revision of the genus *Apha* Walker, 1855, a group of tropical monkey moths which are endemic to southeastern Asia but not known to extend to Sundaland.

During work with the Vietnamese members of the family, identification proved to be problematic; reference data were fragmentary and often controversial, there were no data on genitalic characters of some species, and great taxonomic confu-

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sion in species interpretation was experienced. This lack of data prompted us to undertake this investigation.

According to the literature, the genus *Apha* Walker, 1855 consists of 6 species and 5 subspecies known mainly from China; their status is not always clear-cut and the status of the subspecies not always correct. Preliminary investigation of material from various museums, particularly those housing the types, and also of our own material, has shown that the genus includes a total of 16 species, 7 of which are not described. Of the latter, 3 are described in this article and the status of the remaining 4 taxa should be changed.

The genus *Apha* is divided into 3 groups based on similarities in genitalic morphology discussed hereunder. These groups are: *floralis* Butler, 1881 – valvae without a saccular lobe (except for *A. witti* sp. nov., which has only a weakly developed one), *subdives* Mell, [1930] – valvae with a saccular lobe, vesica bears an appendix, and *tychoona* Butler, 1871 – valvae with a saccular lobe, vesica without an appendix (Mell (1929 [1930]: 422) included *A. tychoona* Butler, 1871 in the subdives group), but we distinguish this species as a separate group on the basis of several characters discussed below. Although we don't attach taxonomic rank to the groups specified, they can actually be considered as a rank of independent subgenera. This article is devoted to the first group of species, which, according to literary data, includes only two congeners: *A. floralis* Butler, 1881 and *A. kantonensis* Mell, [1930]. They are characterized by the bright yellow coloration of the external margin of the hind wings and in the male genitalia by the lack of any saccular process, the short aedeagus and the vesica lacking an appendix. Three additional species are described in this article as new.

Material and methods

Material for this article comprises eggs and caterpillars of all instars reared by the junior author in Hanoi *ex ovo* from the original material taken by him in Central Vietnam. Additional material was obtained from the collections of various museums. Their abbreviations, as used hereunder, are given below:

CSLL – collection of Swen Löffler – Lichtenstein, Germany; IEBR – Institute of Ecology and Bio-Resources – Hanoi, Vietnam; MNHN – Museum national d'Histoire naturelle – Paris, France; MWM – entomological Museum Th. Witt – Munich, Germany; NSMT – National Science Museum – Tokyo, Japan; SMFL – Forschungsinstitut und Naturmuseum Senckenberg – Frankfurt am Main, Germany; ZFMK, Zoologisches Forschungsinstitut und Museum Alexander Koenig – Bonn, Germany; ZMHU, Zoologisches Museum der A. Humboldt Universität – Berlin, Germany; ZMKU – Zoological Museum of Kiev University – Kiev, Ukraine; ZSM – Zoologische Staatssammlung der Bayerischen Staaten – Munich, Germany.

Further abbreviations used are: TL = type locality; | = a new line in the citations of the labels of holotypes and lectotypes.

The genitalic preparations illustrated were made using standard dissecting techniques and mounted in Euparal on glass slides. The preparations were photographed under magnification using Canon PowerShot A570 and Olympus Camedia C-750

Table 1. List of BOLD barcoded specimens of the group under investigation.

№	Species	Sample ID	BOLD Process ID	Locality	Comments
1	*Apha chloralis*	EUPT-11-043	LBEOA045-11	Vietnam: Quang Nam, Nam Giang distr., Cha Val vill.	Paratype
2	*Apha chloralis*	EUPT-DR-8	LBEOW100-10	Vietnam: Quang Nam, Phuoc Son, Deo Lo Xo	Paratype
3	*Apha chloralis*	VZ-EUPTER-39	LBEOW190-10	Vietnam: Cao Bang, Nguyen Binh, Phia Den	Paratype
4	*Apha floralis*	EUPT-11-040	LBEOA042-11	Nepal: Western Prov., Annapurna Himal, Banthanti vill.	
5	*Apha kantonensis*	EUPT-11-041	LBEOA043-11	Vietnam: Ha Nam, Ninh Binh, Quan Dist., Bong-Cuc Phuong vill.	
6	*Apha kantonensis*	EUPT-11-042	LBEOA044-11	Cambodia: Kampot, Bokor Nature Park, Hill Station	
7	*Apha witti*	2011.65	LBEOW1015-11	China: Sichuan, Siguliang Shan, Wolong Reserve	Paratype
8	*Apha witti*	2011.66	LBEOW1016-11	China: Sichuan, Quonglai Shan	Holotype
9	*Apha witti*	2011.67	LBEOW1017-11	China: Sichuan, Siguliang Shan, Wolong Reserve	Paratype
10	*Apha witti*	2011.69	LBEOW1019-11	China: Sichuan, Quonglai Shan	Paratype
11	*Apha zephyrus*	VZ-EUPTER-6	LBEOW096-10	Vietnam: Lai Chau, Fan Si Pan Mts, 5 km N Sa Pa	Paratype
12	*Apha zephyrus*	2011.68	LBEOW1018-11	Myanmar: Kachin, Chudu Raji	Paratype
13	*Apha zephyrus*	EUPT-11-044	LBEOA046-11	China: Yunnan, Diancang Shan	Holotype
14	*Apha zephyrus*	EUPT-11-045	LBEOA047-11	China: Yunnan, 18 km SW of Baoshan	Paratype
15	*Apha zephyrus*	SNB 2525	SASNC441-11	Myanmar: Kachin, Chudu Razi Hills, 30 miles E of Kawnglanghpu	

camera with Soligor Adapter Tube for Olympus and Slide Duplicator for Digital 10 dptrs modified for object glasses. All figures in the article were produced by Sergey Pugaev using Adobe Photoshop 7.0 from photographs taken partly by himself, and also by Dieter Stüning, Tran Thieu Du, Vadim V. Zolotuhin and Alexey Prozorov. The final version of illustrations is also produced by Sergey N. Pugaev.

The sequences of mitochondrial gene cytochrome *c* oxidase I (658 bp) are used here for taxonomic purposes. They are kept in the base of sequences of "The Barcode of Life Data System" international project (BOLD, URL: http://www.boldsystems.org/) in authors' projects LBEOW and LBEOA (Table 1).

Taxonomy

Apha floralis Butler, 1881 species group

Description. Moderate sized moths (fore wing length 24–29 mm in males, 30–35 mm in females), characterized by bright, contrasting pattern. The basal fascia of the fore wing is dark brown, dentate and sometimes indistinct. The discal spot is round, dark brown and is always present. The antemedial fascia is angled or curved, towards the costa approximately at a right angle. The apical patch of the fore wing is elongated, semicircular, and extends along the costa. It is pale in colour, usually with a dark centre. The postmedial fascia is yellow, usually of the same colour as the apical forewing patch, straight, and running towards the apex of the wing; it is fused with the apical patch in *A. floralis*, *A. zephyrus*, *A. witti*, *A. kantonensis*, and *A. chloralis*. The postmedial fascia is bordered basally by a well expressed, thin, dark shadow giving the impression that it is a double line; in some species the postmedial fascia is not clearly visible and weakly separable in colour from the distal part of the wing, but its basal shadow is always well defined. The submarginal fascia is zigzag-shaped, brown, sometimes indistinct. The hind wings are darker basally while the external field is bright yellow, usually without prominent pattern. The postmedial fasciae of the hind wings are of the same colour as those of the fore wings.

Male genitalia. Uncus well developed, bilobed; the lobes usually strongly widened at the apex; gnathos very weakly sclerotized, distinct and consisting of two separate branches, not fused, but held together by a membrane; valvae are without saccular lobes, however these lobes are present in *A. witti*, but they are weakly developed with only a moderate sized prominence; the saccus is weakly developed, the aedeagus width is equal to the coecum length. The vesica is without an appendix and bears cornuti which are not extended longitudinally as in other species groups but form a compact basal circle.

Female genitalia. The papillae anales are ovoid with numerous setae. The posterior and anterior apophyses are almost equal in size, with similar length and width. The postvaginal plate is well developed, with a medial incision; the plate is often transverse (i.e. extended longitudinally across the segment). The antevaginal plate is also well developed, it is high and has a medial incision of different depth. The antrum is short, wide and weakly sclerotized. The ductus bursae is not long; it is membranous or very weakly sclerotized. The corpus bursae is globe-shaped with a single, claw-shaped signum at its equator.

Diagnosis of the group. Valvae are without saccular lobes, except for *A. witti*. The aedeagus is truncated. The antemedial fascia with angle of curvature about 90°.

Distribution. The group occupies the southern area of the generic range and is known from northern India, Nepal, southern China, north-eastern Myanmar, Cambodia, and Vietnam (Figs 39, 40).

Bionomics. Species of this group develop at least two generations per year which can be seasonally dimorphic with regard to size and pigment saturation.

They are confined basically to mountainous relief, known from altitudes of from 500 to 3000 m, but were also found at the lower altitudes of coastal biotopes. The caterpillars are covered with long hairs which are situated in tufts on verrucae but do not form specific brushes. They resemble large Arctiini caterpillars and feed on various deciduous trees and shrubs including members of Anacardiaceae, Annonaceae, Caprifoliaceae, Fabaceae, Malvaceae, Rosaceae, Rubiaceae, Salicaceae and Sapindaceae. The caterpillar stage lasts for 1 to 4-5 months. The pupa is enclosed in a thin, weak cocoon in the shelter of leaves, bark or on soil.

The group inclu des 5 species.

Apha floralis Butler, 1881

Figs 1–4

Apha floralis Butler, 1881, Illustrations of typical specimens of Lepidoptera Heterocera in the collection of the British Museum 5: 64, pl. XCIV, figs 5, 6. TL: "India, Darjeeling". Lectotype: male (BMNH), **here designated** [examined].

= *Preptothauma oxydiata* Draudt, 1931, Entomologische Rundschau 48(11): 121. TL: erroneously given as "West-Columbia, Altaquer, 500 m". Holotype: female (ZMHU) [examined].

Material examined. Lectotype, ♂, Darjiling, 79. 57 (BMNH). Paralectotype, ♀, Darjiling, 79. 57 (BMNH); f#, Darjeeling (ZMHU); ♀, India, Himalaya, Darj[eeling], 15.X [19]18 (MWM); ♂, India W.B., Darjeeling, 2.000 m, 17-22.VII.1989, leg. W. Thomas (SMFL); ♂, Sikkim, Harmand, 1890 (MNHN); 12 ♂♂, Nepal, Annapurna Himal, 1.700 m, 1 km N of Tal, 84°23'E, 28°28'N, 08.VI.1996, leg. Hreblay & Szaboky (MWM); ♀, Nepal Annapurna Himal, 2.450 m, 83°43'E, 28°22'N, 23-24.VI 1996, leg. Gy. M. Lszl & G. Ronkay (MWM); 2 ♂♂, East-Nepal, Surke Danda, 3 km NE Sukeyer, Lali Kharka 18.V.1997, 2.600 m, lg. Hreblay & Szecsenyi (MWM); 3 ♂♂, East-Nepal, Deorali Danda, Anpan, 1.900 m, 18.VI.1998, leg. M. Hreblay & B. Benedek (MWM); 2 ♂♂, E. Nepal, Janakpur, Dolakha Deolari, 2.800 m, 25.V.-7. VI.1994, M. S. Limbu leg. (NSMT); 14 ♂♂, 4 ♀♀, C. Nepal, Kali-Gandaki-Tal, Kalopani-Dhumpu, 2.500 m, 30.V.-15.VI.1973, leg. Dierl-Lehmann (ZSM).

Description. Male (Figs 1, 2). The forewing length is 25–29 mm. The costa is straight; the fore wing apex is weakly falcate. The wing pattern is contrasting, with yellow and bright brown (brick-red) colours predominating. Discal dot is always distinct, dark coloured and rounded. The antemedial fascia is brown to brick-red or light-brown, serrate. The outer field bordering the antemedial fascia can have duplicating serrate fasciae (from one to three). The postmedial fascia is straight, bright yellow in colour and has the distal margin extending to the apex. The fore wing apical patch is elongated, yellow or pale yellow. The postmedial fascia of the fore wing is fused with the distal part of the apical patch. It is bordered basally by a thin dark shadow which does not reach the wing apex, but is angled towards the costa. The

Figures 1–8. 1 – male lectotype *Apha floralis* Butler, 1881, Darjiling, 79. 57 (BMNH); **2** – male *A. floralis* Butler, 1881, East-Nepal, Surke Danda, 3 km NE Sukeyer, Lali Kharka 18.V.1997, 2.600 m, lg. Hreblay & Szecsenyi (MWM); **3** – female *A. floralis* Butler, 1881, Nepal Annapurna Himal, 2.450 m, 83°43'E, 28°22'N, 23-24.VI 1996, leg. Gy. M. Lszl & G. Ronkay (MWM); **4** – female holotype *Preptothauma oxydiata* Draudt, 1931, West-Columbia, Altaquer, 500 m., März-Juni 1927 (ZMHU); **5** – male holotype *Apha zephyrus* sp. n., China/Yunnan, Dianceng Shan, 25°41'N, 100°05'E, 2.200 m, 15-30.VII.2004, leg. Sinaev & his team (MWM); **6** – female allotype *A. zephyrus* sp. n., China, Prov. Nord-Yuennan, Li-kiang, 2.000 m, 3.VII.1935, H. Höne (ZFMK); **7** – male holotype *A. witti* sp. n., China, Sichuan, Qionglai Shan, 31°13'N, 102°23'E, May 2006, 1.400 m, leg. Siniaev & his team (MWM); **8** – female allotype *A. witti* sp. n., China/Sichuan, Qionglai Shan, 31°13'N, 102°23'E, May 2006, 1400 m, leg. Siniaev & his team (MWM).

submarginal fascia is zigzag-shaped, with expansion along the veins, terminating as a dark field at the wing apex. The postmedial fascia situated across the middle of the hind wing separates the outer yellow field of the wing from the inner brown one. The latter itself becoming more yellowish basally; submarginal fascia brown, zigzag-shaped, with corresponding separate dots on veins.

Male genitalia (Figs 15, 16). Lobes of uncus are narrow, sabre-shaped with rounded apex, their bases fused at one third of their length. The valvae are roundly triangular; without saccular lobes but with three small spurs which are directed inwards (sometimes hardly visible depending on the preparation). The coecum is short, not longer than its width; the opening of vesica is usually more sclerotized. The vesica is dome-shaped, its base is completely covered with short cornuti which are poorly extended to the aedeagus tube.

Female (Figs 3, 4). Length of the fore wing is 31 – 33 mm; similar in pattern to the male but is generally larger and paler. Additionally, the female is not so contrastingly coloured. The wings are wider with a more blunt apex and with vague basal fascia and light brown discal dot. The abdomen is light red laterally and terminally.

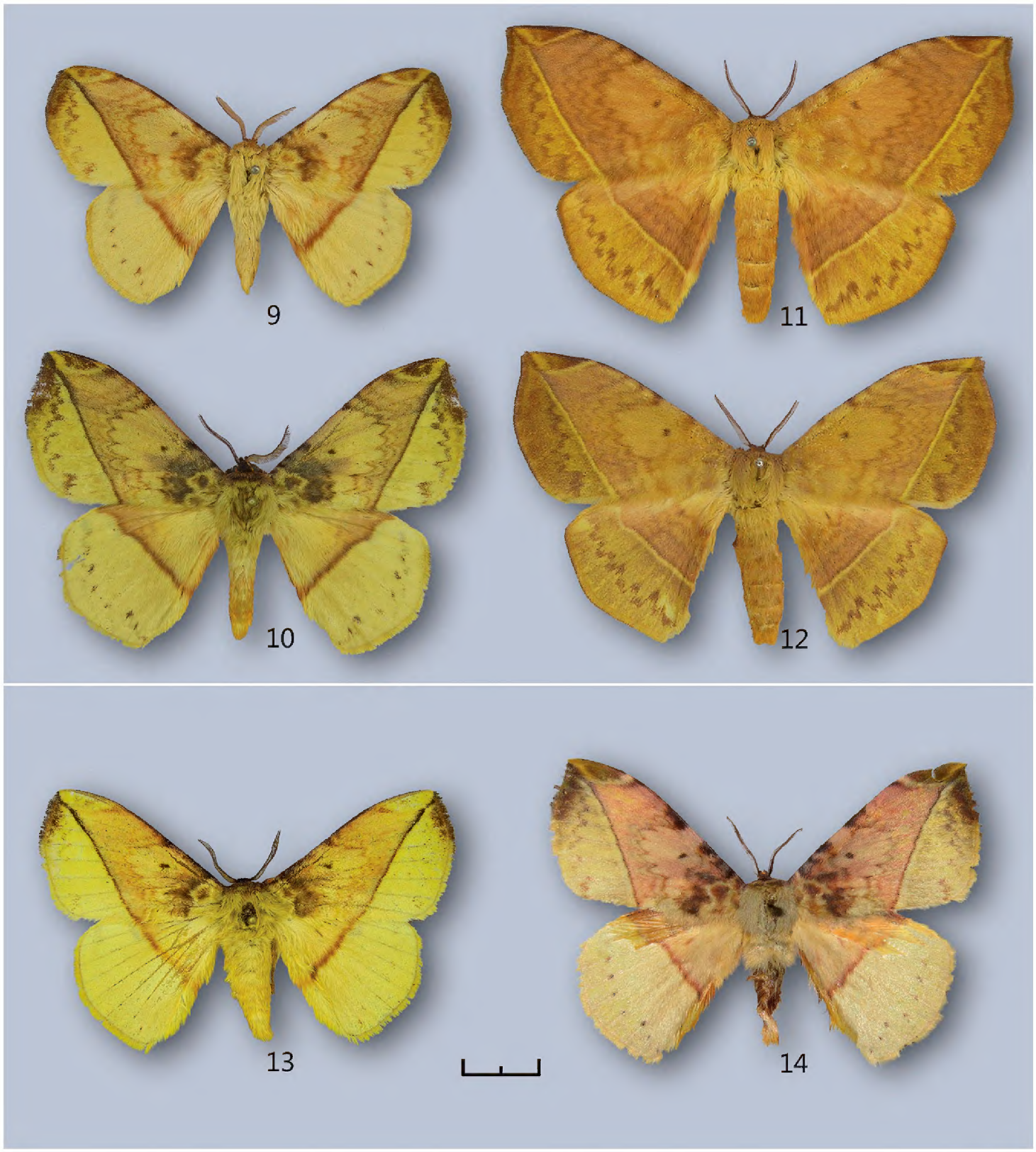
Female genitalia (Figs 21–23). Ovipositor lobes are bean-shaped. Anterior apophyses are slender with well-marked, sclerotized base extending to the base of posterior apophyses which are a bit shorter. Postvaginal plate with acute margins and well-marked medio-caudal dent. Ostium is sheltered by the antevaginal plate which consists of two lobes laterally. Antrum is wide, calycine, slightly sclerotized, standing proud of antevaginal plate ventrally. Ductus bursae is not sclerotized, wide up to the curve and narrowing beyond that. A single thorn-shaped signum is situated at the equator of the corpus bursae, long, slightly curved, with broader base.

Diagnosis. The males of the species differ from some of the other members of the group by having a well expressed "double" postmedial fascia on the hind wing. This "double" postmedial fascia can be also found in *A. zephyrus* and *A. witti*, but in both the latter species this fascia (not its basal shadow) is much more weakly expressed. The species *A. floralis* can be distinguished from *A. zephyrus* sp. nov. and *A. witti* sp. nov. by the smaller distance between the postmedial fascia and outer wing margin. Lobes of uncus are more slender and longer than in other species. Valvae with small apical spurs visible only under magnification. Aedeagus is straight in contrast to faintly curved in the other three species, cornuti on vesica are sparse, not dense as in other species. Saccus is small and not substantially distinguished.

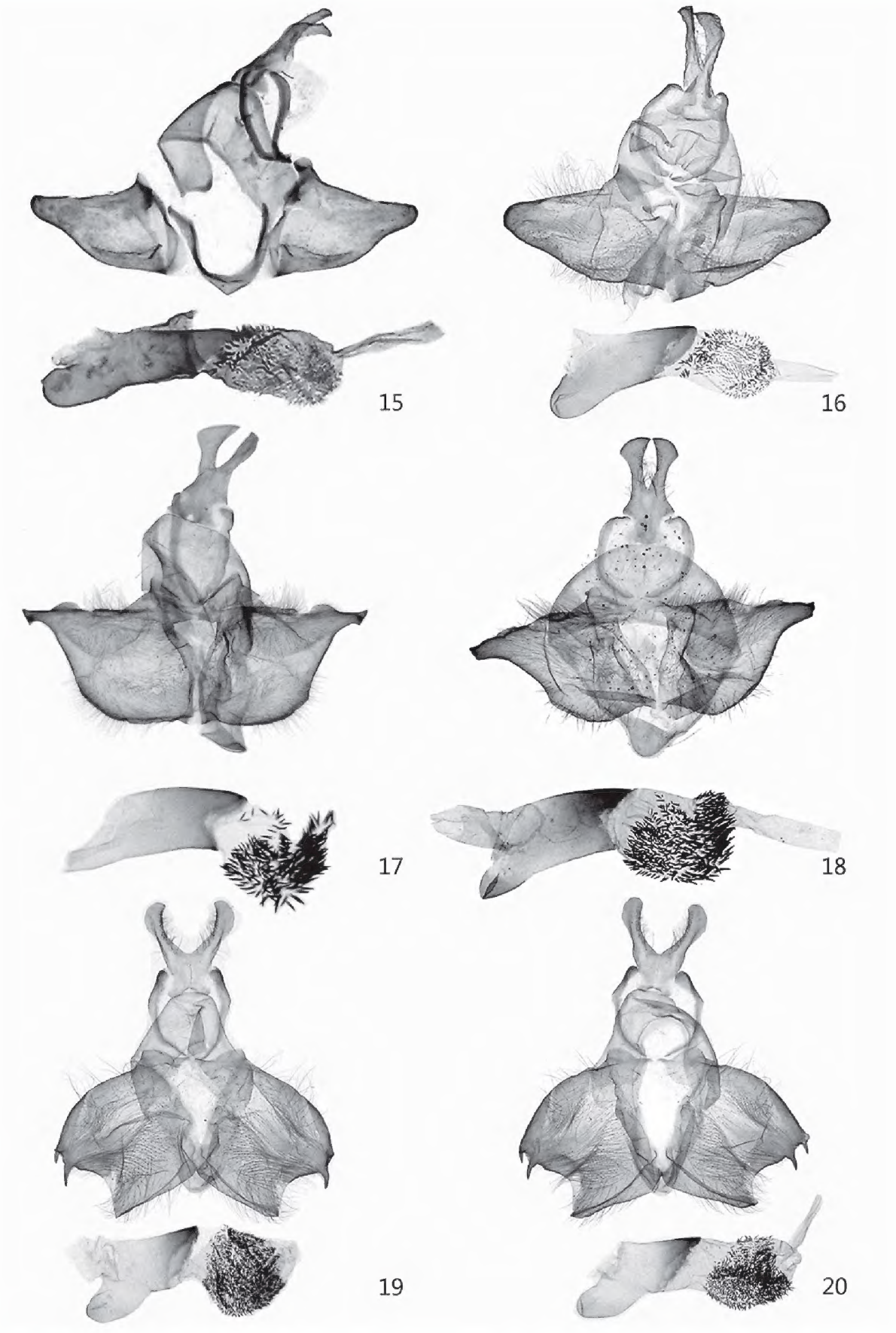
Distribution. Northern India and Nepal (Fig. 58).

Bionomics. Mountain species producing at least two generations per year with flight periods in June-July and October; it can be found at altitudes of 1.700 – 2.500 m. Preimaginal stages and host plants are unknown.

Taxonomic remarks. 1. The species was described from a pair with a remark "Darjiling (Lidderdale & Sadler)". Both specimens are currently deposited in the BMNH and the male is specified as a lectotype. It completely matches the original description by Butler (1881: pl. XCIV, fig. 5) and has the following labels: yellowed rectangle with the inscription «*Apha* | *floralis* ♂| Butler, Type» and overleaf «Darjil-



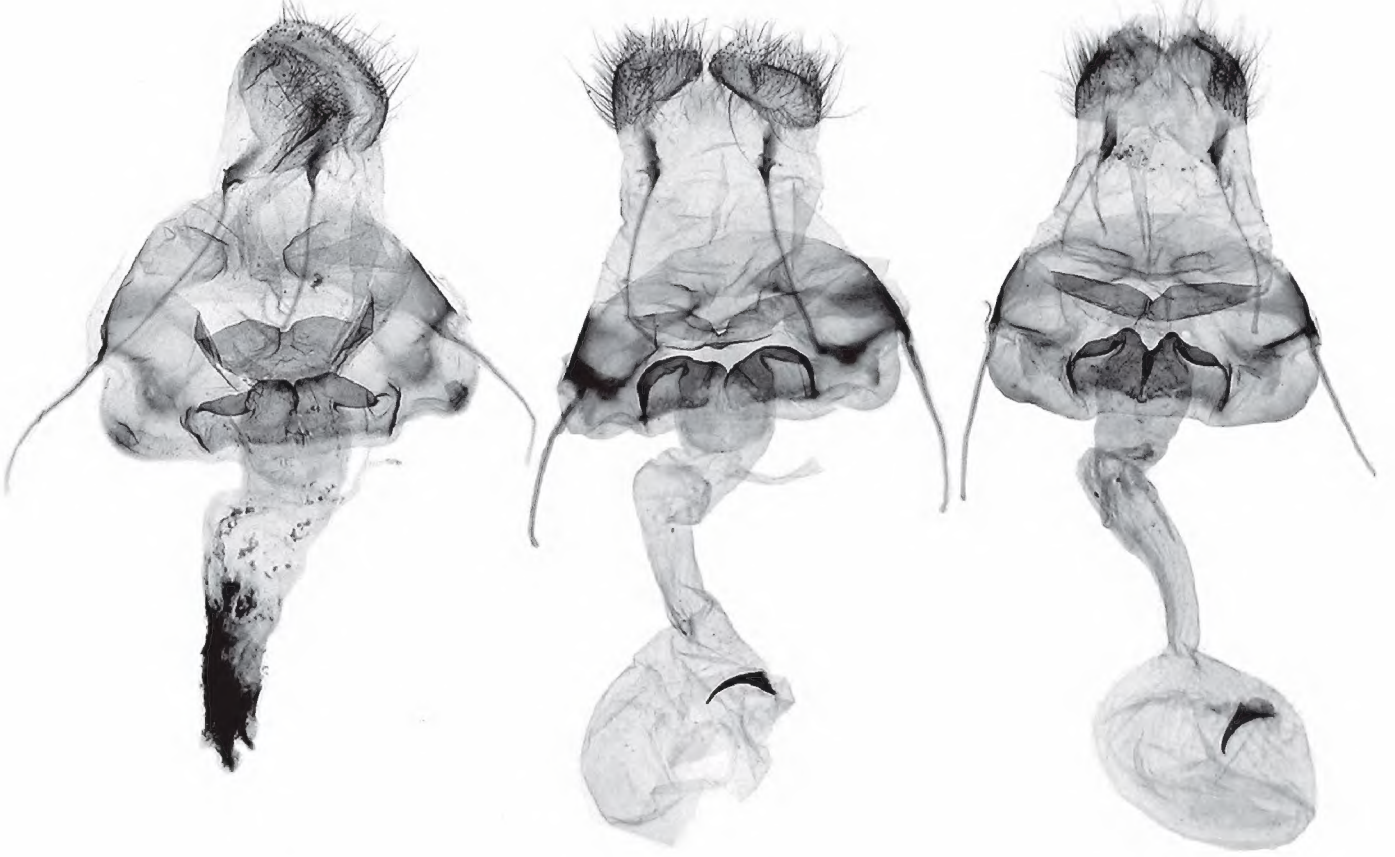
Figures 9–14. 9 – male holotype *A. kantonensis* [1930], China, Kwangtung, [Lo fao shan] (ZMHU); **10** – male *A. kantonensis* Mell, [1930], N. Vietnam, Prov. Ninh Binh, Nho Quan Distr., Bong – Cuc Phuong vill., 20°21'N, 105°36'E, 6-9.X.2008, 360 m, leg. Zolotuhin (MWM); **11** – female paratype *A. kantonensis* Mell, 1929, [China] [?? Lo Fao], "ex Raupe", ex coll. R. Mell (ZMHU); **12** – female paratype *A. kantonensis* Mell, 1929, [China] [?? Lo Fao], ex Raupe, ex coll. R. Mell (ZMHU); **13** – male holotype *A. chloralis* sp. n., Vietnam, Cha Val, Nam Giang, Quang Nam, 15°35'21.9"N, 107°29'01.9"E, RTS, 546 m, 28.V.2009, Tran Thieu Du leg. (coll. S. Pugaev); **14** – male paratype *A. chloralis* sp. n., N. Vietnam, Cao Bang Prov., Phi Oak Mts., Nguyen Binh Distr., Thanh Cang comm., Phia Den vill., 22°34'N, 105°52'E, 1030 m, pupa 10.XI.2009, ex pupa 22.XII.2009, leg. S. Pugaev (coll. S. Pugaev).



Figures 15–20. Male genitalia: **15** – holotype *Apha floralis* Butler, 1881, GU-93, Darjiling, 79. 57 (BMNH); **16** – *A. floralis* Butler, 1881, MWM-11.922, Nepal, Annapurna Himal, 1.700 m, 1 km N of Tal, 84°23'E, 28°28'N, 08.VI.1996, leg. Hreblay & Szaboky (MWM); **17** – holotype *A. zephyrus* sp. n., MWM-16.858, China/Yunnan, Dianceng Shan, 25°41'N, 100°05'E, 2.200 m, 15-30.VII.2004, leg. Sinaev & his team (MWM); **18** – paratype *A. zephyrus* sp. n., SMFL-2135.10, East-Tibet Tongme-Pelung, 2.000 m, 24.06.96 (SMFL); **19** – holotype *A. witti* sp. n., MWM-17.770, China, Sichuan, Qionglai Shan, 31°13'N, 102°23'E, May 2006, 1.400 m, leg. Siniaev & his team (MWM); **20** – paratype *A. witti* sp. n., MWM-17.745, China, Sichuan, Wolong Reserv, Siguliang Shan, 31°09'N, 103°06'E, May 2006, 1.500-1.800 m, leg. Siniaev & his team (MWM).

ing | 79.57»; a rectangular small label «Darj.»; a circle with red framing and overprint «Type». It is supplied with a standard red label with overprint «Eupterotidae | LECTOTYPE ♂ | *Apha* | *floralis* Butler, 1881 | Typical Spec. Lep. Het. | Brit. Mus. 5: 64. | des. S. Pugaev 2011». The syntypic female becomes therefore a paralectotype and is supplied with a corresponding red label.

2. Incorrect geographic label of *Preptothauma oxydiata* Draudt, 1931 (Fig. 4) was already discussed by Forbes (1955: 85) who stated «A fourth species described from western Colombia … agrees as figured so exactly with the east Asiatic *A. subdives* Butler that I am inclined to believe there has been an error in the locality». Nässig and Oberprieler (2008: 62-63) noted as well: «…*Preptothauma oxydiata*…, it evidently represents either *A. subdives*, *A. floralis* Butler 1881 or a closely related species». The external characters and female genitalia of the taxon *Preptothauma oxydiata* unambiguously correspond to *A. floralis* and are well distinguished from the rest of the allied species; the synonymy of *A. floralis* and *P. oxydiata* was established by Becker (1996: 61). However, *P. oxydiata* is type species of the genus *Preptothauma* Draudt which therefore becomes a new synonym of *Apha* (this has not been stated by Becker), **syn. nov.**



21 22 23

Figures 21–23. Female genitalia: **21** – paratype *A. floralis* Butler, 1881, ZMHU-2007-11, paralectotype, Darjiling, 79. 57 (BMNH); **22** – *A. floralis* Butler, 1881, MWM-17.451, Nepal Annapurna Himal, 2.450 m, 83°43'E, 28°22'N, 23-24.VI 1996, leg. Gy. M. Lszl & G. Ronkay (MWM); **23** – holotype *Preptothauma oxydiata* Draudt, 1931, ZMHU-2010-01, West-Columbia, Altaquer, 500 m., März-Juni 1927 (ZMHU).

***Apha zephyrus* Zolotuhin & Pugaev, sp. nov.**
http://zoobank.org/B377463F-4DC5-4892-B02C-5CA1D6BD68AF
Figs 5, 6

Material examined. Holotype, ♂, "China/Yunnan, | Dianceng Shan, | 25°41'N, 100°05'E, | 2.200 m, 15-30.VII.2004, | leg. Sinaev & his team" (MWM). Allotype, ♀, China, Prov. Nord-Yuennan, Li-kiang, 2.000 m, 3.VII.1935, H. Höne (ZFMK). Paratypes, 6 ♂♂, China, prov. Yunnan, Dali Bali aut. Pref., Yunlong, 13 km N of Caojian, Feng Shuing Mts, 2.400 m, 20.V.-23.VI. 1999, leg. R. Brechlin (MWM); ♂, China, Yunnan, 18 km SW of Baoshan, 2.100 m, 16-19.V.2003, leg. Murzin (MWM); ♂, China, Yunnan, Wudingshan, N-Xiangyan, 3.200 m, VI.2000, leg. native collector (MWM); 2 ♂♂, China, W-Yunnan, Wudingshan, N-Xiangyan, 3.200 m, E. VI. 2000, leg. local collector (SMFL); 2 ♂♂, China, Yunnan, Dian Cang Shan, 25°41'N, 100°05'E, 2.200 m, 15-30.VII.2004, leg. Siniaev & his team (MWM); m#, China, South-Yunnan, Yueson Ximeng, 1.200 m, Mitte V.2000, leg. native collector (MWM); 2 ♂♂, China, E-Yunnan, Huangcaotai, Malong, 2.450 m, EVI. 2000, leg. local collector (SMFL); ♂, China, E-Yunnan, West Qiubei, Yangxiong Mts. 2.500 m, VI.2000, leg. native collector (MWM); 3 ♂♂, China, Prov. Nord-Yuennan, Li-kiang, 9., 14., 16.VII.1934, H. Höne (ZFMK); ♂, China, N-Yunnan, Sanfengshan, Yaoan, 2.200 m, VII. 2000, leg. local collector (SMFL); 3 ♂♂, China, SE-Sichuan, Gaomushan, Guling (near west Guizhou border), about 1.900 m, leg. Ying et al. (SMFL); ♂, China, prov. Jiangxi/Fujian, Wuyi Mt., Zhod, 1.490 m, VIII.2000, leg. native collector (MWM); ♂, Thibet, H. Testont (MNHN); m#, East-Tibet, Tonge-Pelung, 2.000 m, 24.VI.[19]96 (SMFL); m#, Thibet Oriental, Chasseurs thibetains du P. Dejean, 1903 (MNHN); ♂, Tibet, Vrianatong, E. Le-Moult, coll. Sheljuzhko (ZMSU); ♂, Myanmar, VIII.2006, Chudu Raji, 2.800 m, Kachin (SMFL); ♂, N. Vietnam, Mt. Fan-si-pan, 1.600-1.800 m, near Chapa, 22°20'N, 103°40'E, secondary forest, May 1996, leg. local collectors (MWM).

Description. Male (Fig. 5). The fore wing length is 25–29 mm. The costa is straight; the fore wing apex is weakly falcate. The antemedial fascia is dimpled and curved. The postmedial fascia is straight and ends in the apex zone, but does not reach the apex. The submarginal fascia is sinuate and joins with the postmedial fascia at the wing apex. The postmedial fascia is a "double" line. The fore wing yellow apical patch encloses a distinct black spot. The discal dot is ovoid, dark brown and distinct. The basal spot is wide, dark brown with ragged margins, sometimes indistinct or completely absent. In the hind wing, the postmedial fascia is straight until approaching the costa where it angles outwards, it has a sharp inner boundary and is distinctly separated from the basal dark shadow, but the outer boundary of the fascia is not well defined and blurred. The submarginal fascia is present as a line of dashes on the veins terminating near the costa as an indistinct patch.

Male genitalia (Figs 17, 18). The bases of uncus lobes are slender and distinctly separated; their apices are pointed and directed inwards. The base of the valvae is wide but narrows towards the apex and terminates in two small spurs. The costa is straight with a little, medial depression. The saccus is not large, its length not greater

than its width. The aedeagus is short, thick; its coecum is rounded and twice as long as it is wide. Distally the vesica is curved at a right angle to the utricular basal part carrying cornuti. All cornuti are of equal length.

Female (Fig. 6). The fore wing length is about 33 mm. The females are paler and the wings broader than the males, but the wing pattern is similar. In the hind wings the indistinct patch situated near the costa on the submarginal fascia is developed as in males.

Female genitalia (Fig. 28). The anterior apophyses are 3 times shorter than the posterior apophyses, with small apical rounded thickening. The postvaginal plate has a broad medio-caudal dent. The antevaginal plate consists of a pair of small plates, which are situated close together. The antrum is rectangular, sclerotized, slightly longer than the antevaginal plate. The ductus bursae has constant width along the full length. The corpus bursae is ball-shaped, with a medial thorn-shaped signum.

Diagnosis. This taxon is a sister species of *A. floralis* and is its vicariant, being found allopatrically in southern China, northern Vietnam and north-eastern Myanmar. The costal margin of the fore wing is straight as in *A. floralis*, it distinguishes them from *A. kantonensis* and *A. chloralis*. The yellow postmedial fascia of the hind wing is not distinctly visible (but its basal shadow is well expressed) and does not transect the middle of the wing as in A. floralis but is closer to a wing base. The apical fore wing patch is yellow, and encloses a distinct black spot. The submarginal fascia terminates apically as two dots on the vein. It also differs from related species in genitalic characters, especially by the wide valvae base, the narrowed apex which terminates with one, two or three small spurs, and the small, medial depression on a straight costa; the lobes of the uncus are narrowly separated from each other in contrast to *A. floralis* and *A. kantonensis*. From *A. chloralis* it also differs in the shape of the uncus lobes. Vesica with cornuti different from *A. floralis* but similar to *A. kantonensis* and *A. chloralis*; the field with cornuti is divided into two parts by a ring lacking any cornuti. Position of the postmedial fascia in the hind wing distinguishes the females of the species from those of *A. floralis*: in *A. floralis* it divides the wing into two, rather equal halves and therefore its end point on the hind wing costa does not correspond to the fore wing's postmedial fascia at the tornus. In contrast, in *A. zephyrus*, both fore and hind wing fasciae come together at almost the same point. The signum is a bit shorter than in *A. floralis*. The species *A. zephyrus* differs from *A. witti* by the presence of a dark small spot near the forewing apex situated close to the costa and by the blurred dark submarginal marking near the costa of the hind wing (*A. witti* has no such markings); the length of the rami in the *A. zephyrus* male antennae are diagnostically half the length of those of *A. witti*. Transversal hind wing fascia diagnostically angled in M1 zone in both sexes in *A. zephyrus*.

Distribution. China: Yunnan, Jiangxi, Sichuan, Xizang; northern Vietnam; north-eastern Myanmar (Fig. 58).

Bionomics. This high altitude, montane species develops one generation per year; the moths are on the wing from May to August depending on the elevation at which they occur. They are known from 1200–3200 m. Preimaginal stages and host plants are unknown.

Etymology. In Greek mythology, Zephyrus or Zephyr (Greek: Ζέφυρος), is the god of the West Wind. He was reported to have had several wives in different stories, one of which was the nymph Chloris, upon whom he bestowed the domain of the flowers. The Romans later raised her status to goddess and gave her the name of Flora – the Latin name for flowers.

***Apha witti* Zolotuhin & Pugaev, sp. nov.**
http://zoobank.org/3D87853D-ED60-42F8-B140-F07ADAF496DD
Figs 7, 8

Material examined. Holotype, ♂, China/ Sichuan, | Qionglai Shan, | 31°13'N, 102°23'E, | May 2006, 1.400 m, | leg. Siniaev & his team (MWM). Allotype, ♀, China/Sichuan, Qionglai Shan, 31°13'N, 102°23'E, May 2006, 1400 m, leg. Siniaev & his team (MWM). Paratypes, 6 ♂♂, China, Sichuan, Qionglai Shan, 31°13'N, 102°23'E, May 2006, 1.400 m, leg. Siniaev & his team (MWM); 4 ♂♂, China, Sichuan, Wolong Reserve, Siguliang Shan, 31°09'N, 103°06'E, May 2006, 1.500-1.800 m, leg. Sinaev & his team (MWM); ♂, China, Sichuan, Dayu, Xiling, 1.900 m, 22.IV.2001, Nativ. coll. (NSMT).

Description. Male (Fig. 7). The antennae have long rami and their length is a bit more than 1 mm. The forewing length is 26–27 mm. The forewing costa is straight, with pointed apex. The basal fascia is broad, brown, irregularly shaped. The discal dot is round, brown. The antemedial fascia is crenulate and curved towards the costa. The postmedial fascia is straight and ends in the apex zone, but not reaching the apex; it is a "double" line and similar in this respect to *A. floralis* and *A. zephyrus*. The apical fore wing patch is yellow or pale yellow. The submarginal fascia is dentate, brown. In the hind wings the postmedial fascia is straight. The submarginal fascia is curved and consists of dots situated on the veins.

Male genitalia (Figs 19, 20). The lobes of the uncus are similar to those of *A. zephyrus*. The valvae are broad basally; their costa is concave. The cucculus is dome-shaped, with two apical spurs. The sacculus is moderately developed, triangular, pointed apically. The saccus is weakly developed, almost not protruding. The aedeagus is short, broad, with rounded coecum. The vesica is in the shape of an inverted dome, with the opening on the top; it is covered with small cornuti, which form a single, round field.

Female (Fig. 8). Fore wing length 30 mm. The females generally resemble the males of the species, but are paler, with wider wings. The female differs from *A. floralis* in the location of the postmedial fascia of the hind wing which is aligned with postmedial fascia on the fore wing (it does not transect the wing medially as in *A. floralis*, but is found closer to the base).

Female genitalia (Fig. 29). The papillae anales are bean-shaped. The posterior and anterior apophyses are of almost equal size, similar both in length, and width. The postvaginal plate has a medio-caudal dentition. The antevaginal plate consists

of two high, rounded lobes with a slit between them. The antrum is bulb-shaped, equal to the antevaginal plate in height, slightly sclerotized. The ductus bursae is straight, membranous. The corpus bursae is circular-shaped, with a claw-shaped signum on the equator, somewhat shorter than in *A. floralis*.

Diagnosis. A sister species to *A. zephyrus* and *A. floralis*; all of them very similar externally. The species *A. witti* can be separated from *A. floralis* by the position of the postmedial fascia of the hind wing which is located more basally in *A. witti*; the submarginal fascia of the hind wing is excavate in *A. witti*, but is dentate in *A. floralis*. In *A. witti* the rami of the male antennae are twice as long as those of *A. zephyrus* (Figs 56, 57). The new species is easily distinguished by the male genitalia; although the shape of the uncus lobes resemble those of *A. zephyrus* and the shape of the aedeagus and vesica are similar to those of *A. floralis*, A. witti's valvae are of diagnostic shape, quite dissimilar to those of either *A. floralis* or *A. zephyrus*.

Distribution. China: Sichuan (Fig. 58).

Bionomics. This high altitude, montane species develops one generation per year; moths are on the wing from April to May depending on the elevation at which they occur, they are known from 1.200 – 1.900 m. The preimaginal stages and host plants are still unknown.

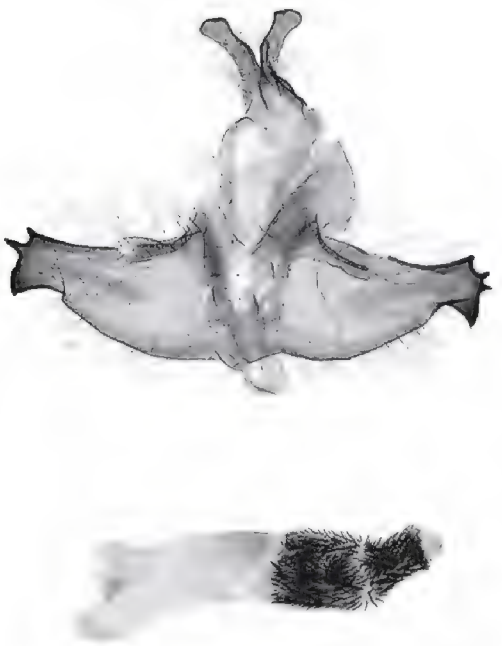
Etymology. The species is named in honor of the eminent entomologist late Dr. Thomas J. Witt (Munich, Germany) He has made many outstanding contributions to the study of Lepidoptera worldwide and is well known for his support of young scientists; he is the founder of the largest Lepidoptera collection in Europe and it is thanks to this collection that the new species was revealed.

Apha kantonensis Mell, [1930]

Figs 9–12

Apha kantonensis Mell, [1930], *Deutsche entomologische Zeitschrift* 1929 5: 428, fig. 43, figs 54; pl. 8: 9, 10; pl. 12: 2. TL: China, "Südkwangtung [= South Guangdong prov.], Lo fao shan". Holotype (by original designation): male (ZMHU) [examined].

Material examined. Holotype, ♂, China, Kwangtung, [Lo fao shan] (ZMHU). Paratypes, 2 ♂♂, 3 ♀♀, [China] [mostly unreadable because of Mell's abbreviations or given by him in Chinese, some are pointed from Lo Fao], ex Raupe, ex coll. R. Mell (ZMHU); 3 ♂♂, China, Hong Kong, 100 m, Sekkong, Jan. 1978, leg. Allen (MWM); ♂, China, Hongkong, New Territories, leg. Uk Tau, 27.IV.1998 (SMFL); 2 ♂♂, China, Hongkong, New Territories, leg. Uk Tau, 21.XI. 1998 (SMFL); ♂, N. Vietnam, Prov. Ninh Binh, Nho Quan Distr., Bong – Cuc Phuong vill., 20°21'N, 105°36'E, 6-9.X.2008, 360 m, leg. Zolotuhin (MWM); ♂, Tonkin [Northern Vietnam], An Chau, coll. L. & J. de Joannis (MNHN); ♂, Central Vietnam, Quang Nam Prov., Phuoc Son Distr., Phuos My Comm., Deo Lo Xo, 17.VII 2009, Du Thieu Tran leg.



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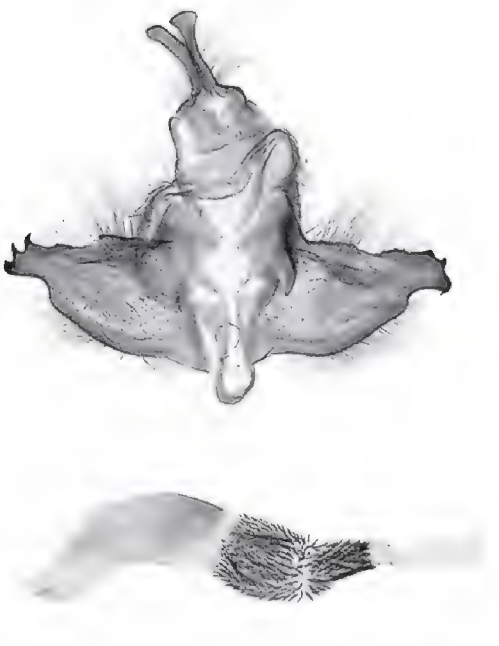

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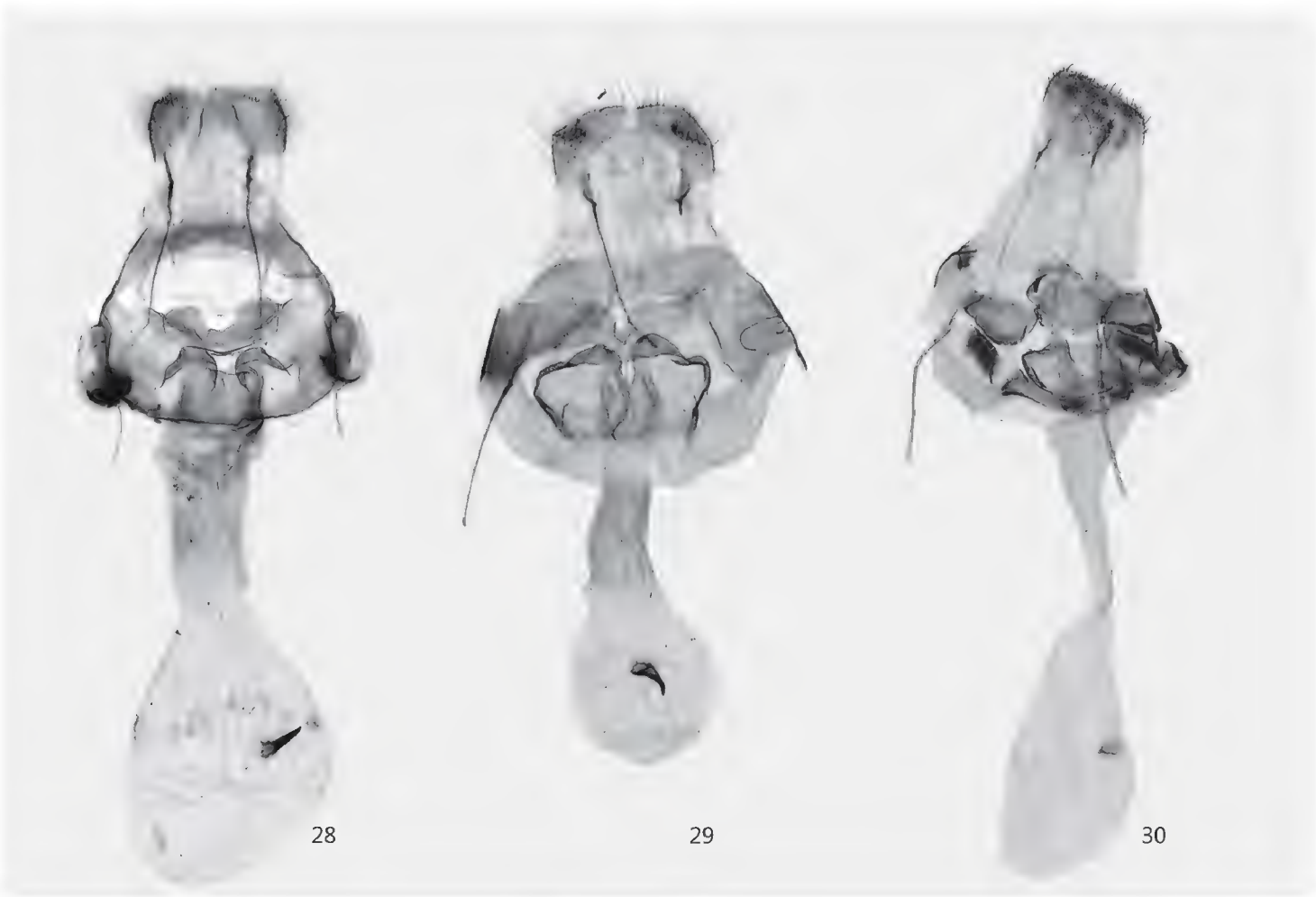
Figures 24–27. Male genitalia: **24** – holotype *A. kantonensis* Mell, [1930], ZMHU-2007-05, [China], ex coll. R. Mell; **25** – *A. kantonensis* Mell, [1930], MWM-11.926, Cambodia, Kampot prov., Bokor M. P., Hill Station, 1025 m, 10°37'37N 104°01.33E, 19-21.I.2006, leg. G. Csorba & G. Ronkay (MWM); **26** – holotype *A. chloralis* sp. n., Vietnam, Cha Val, Nam Giang, Quang Nam, 15°35'21.9"N, 107°29'01.9"E, RTS, 546 m, 28.V.2009, Tran Thieu Du leg. (coll. S. Pugaev); **27** – paratype *A. chloralis* sp. n., N. Vietnam, Cao Bang Prov., Phi Oak Mts., Nguyen Binh Distr., Thanh Cang comm., Phia Den vill., 22°34'N, 105°52'E, 1030 m, pupa 10.XI.2009, ex pupa 22.XII.2009, leg. S. Pugaev (coll. S. Pugaev).

(coll. S. Pugaev); 2 ♂♂, Cambodia, Kampot Prov., Bokor N.P., Hill Station, 1.025 m, 10°37,37'N, 104°01,33'E, 19-21.I.2006, leg. G. Csorba & G. Ronkay (MWM).



Figures 28–30. Female genitalia: **28** – female allotype *A. zephyrus* sp. n., ZFMK-2011-02, China, Prov. Nord-Yuennan, Li-kiang, 2.000 m, 3.VII.1935, H. Höne (ZFMK); **29** – female allotype *A. witti* sp. n., MWM-17.297, China/Sichuan, Qionglai Shan, 31°13'N, 102°23'E, May 2006, 1400 m, leg. Siniaev & his team (MWM); **30** – female paratype *A. kantonensis* Mell, [1930], ZMHU-2007-08, [China], "ex Raupe", ex coll. R. Mell (ZMHU).

Description. Male (Figs 9, 10; Figs 52, 53). Fore wing length 23–29 mm. Costal margin slightly curved, wing apex rounded or weakly acute. There is a dark spot in the yellow basal area of the fore wing. Basal fascia is dentate, inner margin distinct, vague distally. Discal dot is well expressed, round, brown or black. Antemedial fascia is crenulate, thick, with two such duplicating lines on the outer margin. Postmedial fascia is yellow, not well expressed, but with conspicuous inner dark-brown or black shadow which terminates at the wing apex, anterially to the apical patch. The apical patch is yellow, with an enclosed large ovoid dark spot. Submarginal fascia brown, dentate, hardly visible, but widened into well expressed dots on the veins. In the hind wing, the shadow of the postmedial fascia is terracotta, straight, with a slight apical curve, while the yellow postmedial fascia is not well expressed. Medial field is uniformly coloured citron-yellow. Moths emerging in the dry summer season are smaller than those of the wet winter season.

Male genitalia (Figs 24, 25). Bases of uncus lobes situated tightly against each other, their lobes are spatulate. In the valva, the costa is straight, the sacculus margin curved, the apex scoop-shaped and bearing 2 – 3 spurs. Saccus is not expressed. Aedeagus short, coecum almost the same length of the tube of

the aedeagus. Vesica cone-shaped and angled at which point the cornuti change direction forming a bare membranous, circular zone lacking cornuti. Cornuti are of equal length.

Female (Figs 11, 12). Fore wing length 30–35 mm. Apart from the much wider wings, the female is markedly different to the male in the colour of the outer margins which are not yellow but light brown. The postmedial fascia on the fore wing is yellow and falls short of the apex by about 3 mm.

Female genitalia (Fig. 30). Papillae anales are bean-shaped. Anterior apophyses are more slender and longer than the posterior. The postvaginal plate is wide with two rounded, lateral lobes in its upper half. The antevaginal plate has a deep, rounded, medial incision, which divides the plate into two lobes, each lobe is elongated, curved, strongly widened distally to form a fishtail shape and with rounded apical corners. Antrum is wide and short, slightly sclerotized. Ductus is wide at antrum and distinctly narrowed at the teardrop-shaped corpus bursae which has a thorn-shaped signum with a round base at its equator.

Diagnosis. The brown shadow of the postmedial fascia reaches the wing margin at the apex in contrast to *A. floralis*, *A. zephyrus* and *A. witti* which terminates approximately 5 mm from the wing apex. It is very similar to *A. chloralis* in colour and pattern, but in the latter species the submarginal fasciae are vague or absent in the hind wings; in the male genitalia the lobes of the uncus are spatulate.

Bionomics. Localized but rather common in Hong Kong (Roger Kendrick, pers. comm., see also http://www.hkwildlife.net/viewthread.php?tid=12308). Moths are on the wing as two to four generations per year: two are obligate – the first with emergence from October to January; the second from April to May. Intermediate generations are known to occasionally occur. The species is typically coastal and is not known from the interior of the continent. In contrast to *A. chloralis* sp. nov., it does not occur in the higher mountains and is mostly known from lowlands (100 m) up to 1.025 m. The biology of the species was studied by Mell (1929 [1930]) who also figured the caterpillars and pupa of the species (Figs 32, 50, 51). The watery off-white eggs of *A. kantonensis* are approximately 1.5 mm in diameter and 0.76 mm in height. Eggs laid in April hatch in 10 – 12 days. Before hatching, eggs become darker, changing through yellow to brown. Caterpillars of the first instar are 5 mm long, with whitish body and yellow head. There are two rows of black subdorsal verrucas covered with whitish setae of similar length to the larval body (5 – 7 mm). On being disturbed, the caterpillars curl up into a ball which helps them to be rolled away by wind – rather like the seeds of some plants. After the first moult the basic colour changes to whitish–yellow, the caterpillars becoming a bit brighter. After the second moult the head becomes rusty yellow. The number of rusty hairs increases after the third moult. In the fifth instar, after the fourth moult, the caterpillar becomes completely brown with shiny red-brown hairs of approximately 1 cm densely covering its body (Fig. 50). Maximum size of the caterpillars ranged from 4.5 – 5.8 cm. Mell recorded only 4 moults for caterpillars of this species, i.e. only 5 instars. It

contradicts our data concerning allied species as well as other species of this family which all have 7 instars. Host plants are Caprifoliaceae: *Lonicera macrantha* and *L. confusa*, but other bushes and trees could be also be utilized (Mell 1929 [1930]: 422).

Caterpillars grow fast; the spring generation develops in only 31 – 33 days. The pupa is sheltered between leaves in a dense but soft cocoon of 25-35 mm length, densely covered with larval setae. Male pupae reach 22 mm, the females 28 – 29 mm. Antennal cases of both sexes are more than twice as thick at the level of mid legs bases. Cremaster is straight. Pupal (Fig. 36) development is very uneven and usually takes from 14 – 19 but may increase up to 32 – 35 days, pupal diapauses have been recorded up to 114 days (loc. cit.: 424). Mell records copulation by females immediately after hatching; they begin oviposition in 4 days and can lay all their eggs in a single night; female fertility is 87 – 160 eggs.

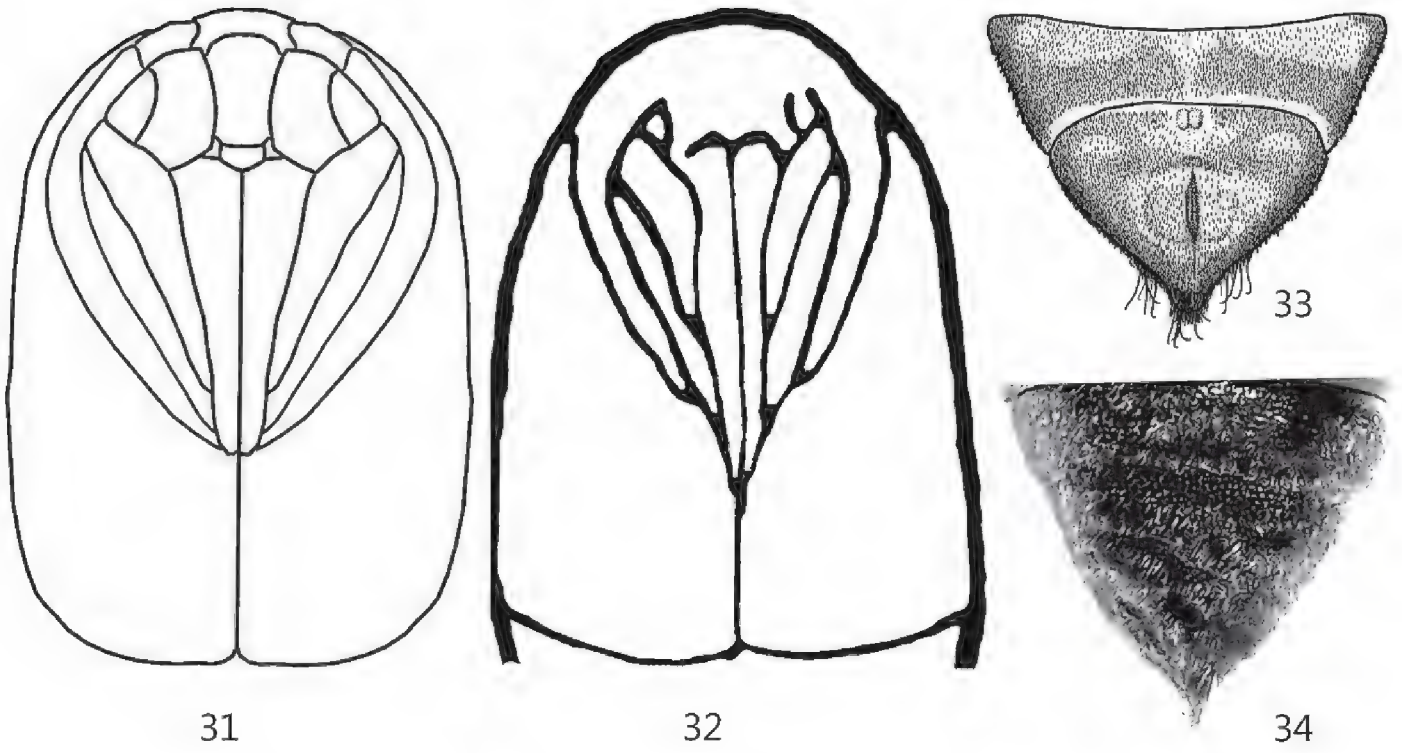
Distribution. South-eastern China: Guangdong; Vietnam; Cambodia (Fig. 59).

***Apha chloralis* Zolotuhin & Tran Thieu, sp. nov.**
http://zoobank.org/F5413289-7E47-4A68-9197-B207F8623DA7
Figs 13, 14

Material examined. Holotype, ♂, Vietnam, | Cha Val, Nam Giang, Quang | Nam, 15°35'21.9"N, | 107°29'01.9"E, RTS, 546 m, VD, | 28.V.2009, Tran Thieu Du leg. (coll. S. Pugaev) | [RTS means "secondary forest" and VD means "come to light trap"] (MWM, GU 35.635). Paratypes, ♂, Vietnam, Cha Val vill., Nam Giang, Quang Nam, 15°35'21.9"N, 107°29'01.9"E, RTS, 546 m, VD, 28.V.2009, Tran Thieu Du leg (IEBR); ♂, Vietnam, S. Vietnam, Quang Nam Prov., Nam Giang Distr., Cha Val vill., secondary forest, 400 m [15°35'21.9"N, 107°29'01.9"E], 24.VI.2009, Tran Thieu Du leg (MWM, GU 17.744); ♂, Central Vietnam, Quang Nam Prov., Phuoc Son Distr., Phuos My Comm., Deo Lo Xo, 17.VII 2009, Du Thieu Tran leg. (coll. S. Pugaev); ♂, N. Vietnam, Cao Bang Prov., Phi Oak Mts., Nguyen Binh Distr., Thanh Cang comm., Phia Den vill., 22°34'N, 105°52'E, 1030 m, pupa 10.XI.2009, ex pupa 22.XII.2009, leg. S. Pugaev (MWM, GU 35.634).

Eggs: C. Vietnam, Prov. Da Nang, comm. Hoa Vang, Ba Na Mts, Da Nang, 15°59.5'N, 107°59'E, 1.500 m, 08.XII 2009, leg. Tran Thieu.

Description. Male (Figs 13, 14). Fore wing slightly rounded at apex. Brown to blackish basal fascia broad, distinct and prominent; the outer margin of the basal fascia is light coloured and blurred. Discal dot distinct, round, dark brown. Antemedial fascia crenulate. Postmedial fascia is yellow, not well expressed, straight, and with contrastingly dark brown basal shadow. Apical patch in the fore wings is yellow, sometimes enclosing a brown, large, semi-ovoid spot. Submarginal fascia dentate, weakly expressed. At the apex, the outer margin of the submarginal fascia is densely irrorated with dark brown scales. On the hind wing, the postmedial fascia is yellow, not clearly visible, with narrow, light brown inner shadow; submarginal fascia almost absent and only noticeable as dots on veins.



Figures 31–34. Pupal characters of *Apha*: **31** – frontal shield of a pupa of *A. chloralis* sp. n.; **32** – same for *A. kantonensis* Mell, [1930] (after Mell 1929 [1930]); **33, 34** – cremaster of a pupa of *A. chloralis*.

Male genitalia (Figs 26, 27). Uncus lobes pointed, boomerang-shaped; their bases separated. Valvae wide at the base and narrowed distally, apically terminating with hook-shaped spurs. Saccus not developed. Aedeagus short and thick; its coecum is not longer than the width. Vesica slightly curved, with a ring lacking scobination in the medial zone where cornuti change their direction. The cornuti are of equal length.

Diagnosis. The paler yellow ground colour distinguishes the species clearly from all other congeners except the externally similar *A. kantonensis*. Both species are found flying allopatrically and can only be reliably separated genitalically. The apex of the uncus lobes is tapered whereas it is spatulate in *A. kantonensis*, the distance between two first spurs on the valvae apex is much greater than in *A. kantonensis* has. The apical lobes of the uncus of *A. kantonensis* are more slender with apex expanded and round while in *A. chloralis* they are stouter, with medial widening and pointed apex; the valve of *A. kantonensis* has 3 spines of the same size while in *A. chloralis* the ventral spine is much larger than the dorsal and medial spines.

Etymology. In Greek mythology, Chloris (or Flora in Roman mythology) was one of the wives of the god of the West Wind Zephyrus. "Chloris" also means a greenish yellow colour typical of the ground colour of the moth.

Preimaginal stages. Eggs (Figs 35, 55). The eggs are semispherical of the upright type, approximately 2.8 mm in diameter and height 1,2 mm, dark yellow without distinct pattern, with flattened base, and a micropyle lying in a small depression at the dorsal pole. Before hatching eggs turn darker brown.

L1 (Figs 37, 38): Head, dorsum and ventral surface dark black; lateral surface of body pale yellowish blue with two thin, dark lines; thoracic legs, abdominal prolegs and anal prolegs reddish brown. Every body segment with 4 scoli, 2 on dorsum and 2 on lateral surfaces, with yellow spots under dorsal verrucae. Each scoli with many brownish white spine-like bristles and very long white hairs.

L2 (Figs 39, 40): The colour, bristles and hairs in this instar are similar to those of L1, but spiracles now visible as small dark dots.

L3 (Figs 41, 42): In general, this instar is not very different from L2, with only minor changes in the colour of the dorsolateral scoli and the spine-like bristles on them which now become reddish brown. The head is black. Legs and prolegs pale to orange.

L4 (Fig. 43): The colouration, bristles and hairs now exhibit major changes to prior instars. Almost all the lateral surface becomes dark black with two brownish, interrupted longitudinal lines and spiracles now easily visible as yellowish white oval spots. All legs and prolegs become dark brown. The bristles and hairs completely change colour to reddish brown. There is a brown border on the head.

L5-L7 (Figs 44-48): The same coloration and pattern as in L4, only with longer and more dense bristles and hairs after each moult; at the end of each instar, before moulting, the caterpillars lost many of their hairs. Caterpillar's body becomes completely dark brown, chaetae and setae hairs become light brown. The brown border on the head becomes more obvious, suture and labrum become light. Appendicular organs remain brown (lighter than body).

Pupa (Figs 31, 49). The pupa is fusiform, with opaque surface, ca. 25 mm long, sclerites are partially covered with short golden setae. The maxillar palpus case reaches wing cases. Fore leg and mid leg cases as well as antennal case reaching that of maxillar palpus. The mandible cases are weakly visible. The cremaster is pointed, conical, with 8 – 10 hook-shaped chaetae arranged in a row, their bases surrounded by thick, short hairs (Figs 33, 34). Antennae and mid legs are of equal length.

Rearing experience. Rearing from eggs was carried out in this study (Figs 35-49). The eggs found were laid in clusters of 10–30 on the lower surface on a leaf of an arboreal species of Fagaceae on 7.XII.2009 in the Ba Na Mountains, Da Nang province (Central Vietnam) at an altitude of about 1500 m. The larvae hatched on 23 to 24.XII.2009. The freshly hatched caterpillars were vigorously active and started to feed after one day. The caterpillars of this species are polyphagous and accept a number of different plants – they were reared on *Dracontomelum duperreanum*, *Allospondias lakonensis* (Anacardiaceae); *Hibiscus rosa-sinensis*, *H. mutabilis* (Malvaceae); *Gardenia* spp. (Rubiaceae); *Rosa* spp. (Rosaceae); *Acacia mangium*, *A. auriculiformis* (Fabaceae); *Salix babylonica* (Salicaceae); *Cananga odorata* (Annonaceae); *Dimocarpus longan* (Sapindaceae). In Hanoi, where the ambient ranges from about 15–20o C, the duration of each instar lasted about 14–19 days. The caterpillars all died at L7. The cause of death is unknown.

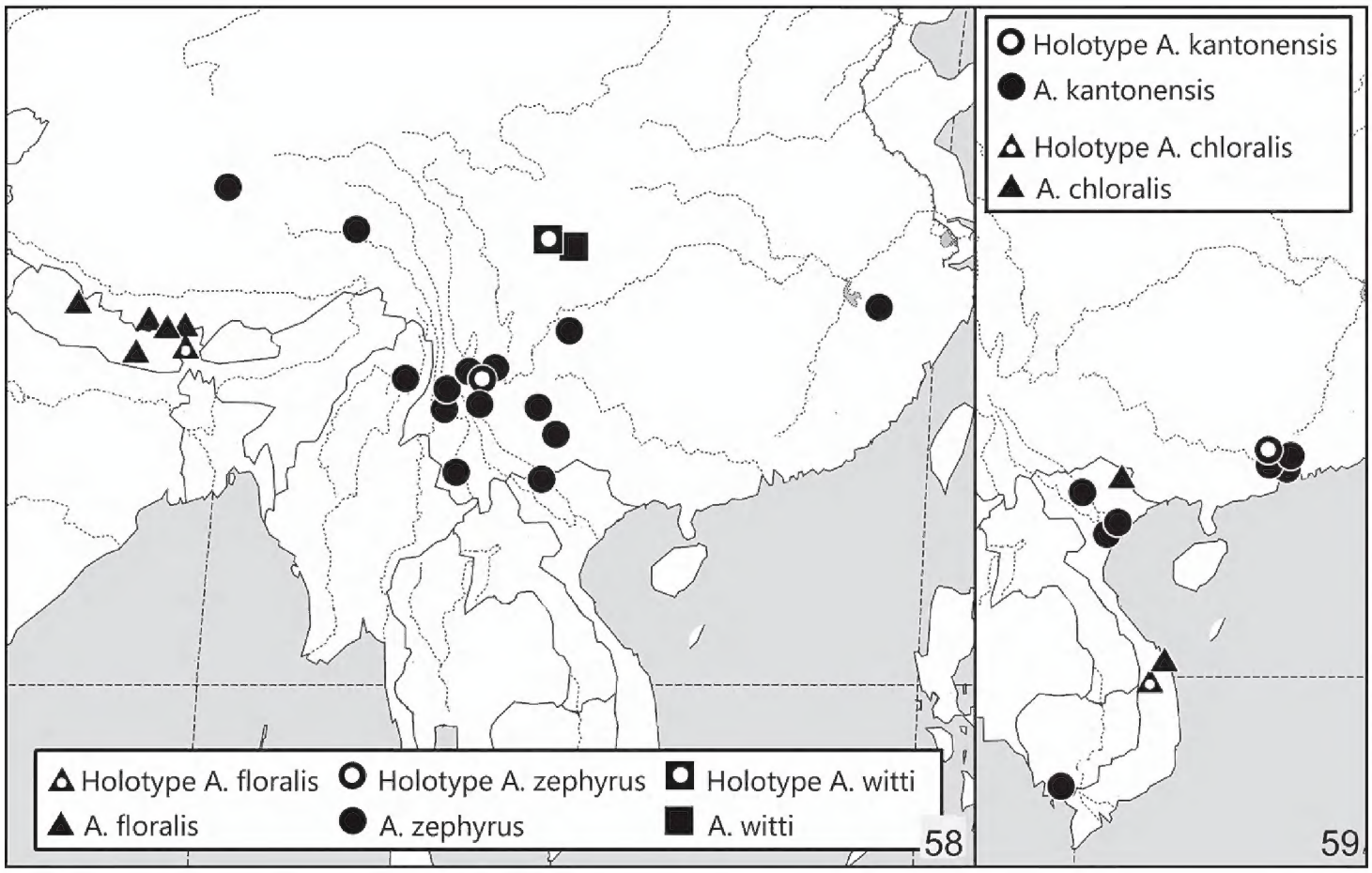
Distribution. Vietnam: Cao Bang, Da Nang, Quang Nam (Fig. 59).

Figures 35–49. Preimaginal stages of *A. chloralis*: **35** – eggs; **36** – head of the caterpillars L6; **37**, **38**– L1; **39**, **40** – L2; **41**, **42** – L3; **43** – L4; **44**, **45** – L5; **46**, **47** – L6; **48** – L7; **49** – pupa.

Figures 50–57. 50, **51** – caterpillars *A. kantonensis* Mell, [1930] (after Mell 1929 [1930]: Tafel VIII, figs 9, 10); **52**, **53** – *Apha kantonensis* Mell, [1930]; **54** – *A. chloralis*; **55** – eggs *A. chloralis*; **56** – antenna of *A. zephyrus* sp. n.; **57** – antenna of *A. witti* sp. n.

Conclusion

Molecular data undertaken (Fig. 60) refer to the analysis of the 5' terminus of the mitochondrial cytochrome c oxidase I (COI) including the standard 648 bp. All data are highly supported. Genetic distances to the closest related species is usually >5% (5.1 for a pair *A. kantonensis*/*chloralis* and 8.8 for *witti*/*zephyrus*) whereas between related species group can achieve 14%. Intrapopulational variation is normally smaller than 0.33% in majority of species, intraspecific variation higher but usually does not exceed 0.6%.



Figures 58–59. Distribution maps of *Apha floralis* group.

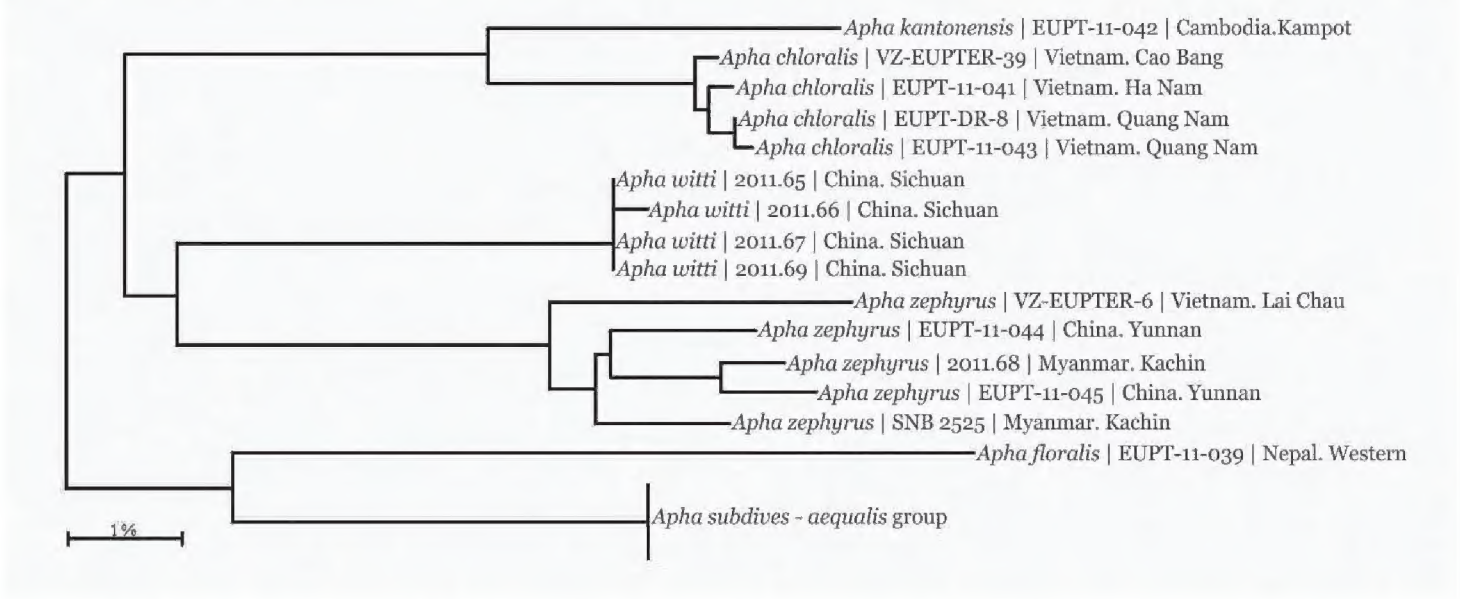

Apha kantonensis | EUPT-11-042 | Cambodia.Kampot
Apha chloralis | VZ-EUPTER-39 | Vietnam. Cao Bang
Apha chloralis | EUPT-11-041 | Vietnam. Ha Nam
Apha chloralis | EUPT-DR-8 | Vietnam. Quang Nam
Apha chloralis | EUPT-11-043 | Vietnam. Quang Nam
Apha witti | 2011.65 | China. Sichuan
Apha witti | 2011.66 | China. Sichuan
Apha witti | 2011.67 | China. Sichuan
Apha witti | 2011.69 | China. Sichuan
Apha zephyrus | VZ-EUPTER-6 | Vietnam. Lai Chau
Apha zephyrus | EUPT-11-044 | China. Yunnan
Apha zephyrus | 2011.68 | Myanmar. Kachin
Apha zephyrus | EUPT-11-045 | China. Yunnan
Apha zephyrus | SNB 2525 | Myanmar. Kachin
Apha floralis | EUPT-11-039 | Nepal. Western
Apha subdives - aequalis group
1%

Figure 60. The tree for *Apha* species based on COI data showing highly supported clusters for all species recognized..

The species *A. zephyrus* is an exception, and genetically it is highly heterogeneous, and here intraspecific variation achieve 1.3–4.9%; this problem requires further study.

The figured dendrogram shows that the complex studied which is called here *A. floralis* group is perhaps not monophyletic but paraphyletic, and therefore can't be separated in a rank of a subgenus. At the same time, it is easily recognizable morphologically because of very diagnostic coloration (mostly of a hind wing) and thus this term can be used for provisory designation of this complex.

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